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10/559,915	12/07/2005	Jacobus Josephus Maria Ruigrok	NL030681US1	9555

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EXAMINER	
LOUIE, MANDY C	

ART UNIT	PAPER NUMBER
1715	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/559,915	RUIGROK ET AL.	
	Examiner	Art Unit	
	MANDY C. LOUIE	1715	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 June 2010*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-8,10-13 and 16-19* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1, 3-8, 10-13 and 16-19* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

2. Claims 1, 3-7, 10 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Voegeli [US 5561896] and evidenced by Pelecky.

Regarding claim 1, Voegeli teaches a method of fabricating a magnetoresistive transducer having a sensor which includes a magnetic layer by fabricating the transducer on a wafer [abstract] and heating the magnetic layer with an electric current, the electric current comprising a current pulse having a duration that is short enough to spatially confine heating to confine heating to the biasing segment (current pulse having a duration such that heat resulting from the current pulse is substantially localized within the magnetic layer structure) [col 3, ln 50-60].

As for selecting a physical process from a plurality of physical processes having corresponding activation energies in the magnetic layer structure based on the current pulse, Voegeli teaches heating the biasing region until a certain time period above a critical conversion temperature [col 5, ln 30-35], and it is further evidenced by Pelecky

that changes in magnetization of a material occur through activation over an energy barrier, wherein each physical mechanism responsible for an energy barrier has an associated length scale [pg 1771]; therefore, one of ordinary skill in the art would have selected a particular duration and amplitude to overcome the activation energy required to achieve the selected magnetic property that is to be modified from a range of magnetic properties with associated activation energies. Voegeli further teaches interdiffusion may be performed with different layers and materials [col 5, ln 63-67; col 6, ln 60-63], where interdiffusion with one set of materials would be different from another interdiffusion with a different set of materials. Hence, the prior art does teaches selecting a physical process from a plurality of different physical processes by suggesting different materials can be used for interdiffusion.

Regarding claim 3, the prior art teaches selecting a physical process (interdiffusion) with a magnetic layer [Voegeli, abstract].

Regarding claim 4, the prior art teaches the time period is short enough such to reduce the lateral spreading of heat [Voegeli, col 7, ln 4-6]. Although the prior art does not explicitly teach increasing the amplitude and decreasing the pulse duration of the current pulse; the prior art does in fact teaches the material conversion depends upon the pulse length, amplitude and duty-cycle [Voegeli, col 9, ln 40-45]. It would have been obvious to one of ordinary skill in the art to optimize such variables as workable parameters that would affect the modification of the magnetic process.

Regarding claim 6, the prior art teaches the device comprises a magnetoresistive device [Voegeli, abstract].

Regarding claim 7, the prior art teaches the device is a sensing device [Voegeli, abstract].

Regarding claim 10, the prior art teaches the duration of the current pulse may be shorter than 100 ms [Voegeli, col 7, ln 5-10].

Regarding claim 16, one of ordinary skill in the art would recognize that a location far away from the heated magnetic layer structure (such as outside the processing chamber) can be considered as an environment outside of the magnetic layer structure that would have a temperature that is substantially the same before and after the current pulse, since a location outside the processing chamber would not receive substantial heat.

Regarding claim 5 which presently depends upon claim 16, the prior art teaches the electric current may comprise a sequence of current pulses [Voegeli, col 7, ln 20-21], wherein as stated above, no substantial heat may be transfer from the magnetic layer structure to the environment.

3. Claims 1 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Voegeli [US 5561896] in view of Shappir [US 20030156456] and evidenced by Pelecky.

Alternatively, Shappir provides further evidence that a plurality of different physical processes (i.e. something other than interdiffusion) can be affected by application of a pulsed current.

Teaching of Voegeli and Pelecky is aforementioned.

Regarding claim 1, Shappir teaches a method for applying operating pulses to memory cells [abstract] which singly changes at least one of an electrical, physical and

mechanical property of the cell [0020] (wherein the operating pulse is measured in voltage; i.e. pulse is electric) [0028]. Shappir further teaches change in the direction of the magnetization of vectors or change in resistance are both considered as examples of electrical, physical and/or mechanical properties [0030].

It would have been obvious to one of ordinary skill in the art to select a physical process from a plurality of physical processes and further modify the magnetic layer structure with a current based upon the selected physical process as suggested by Shappir. One would have been motivated to do so in order to reduce energy use and increase throughput [Shappir, 0013-0014].

Regarding claim 18, the prior art teaches the plurality of physical processes comprises changing resistance of at least one layer in the magnetic layer structure and changing magnetization direction of at least one layer in the magnetic layer structure [Shappir, 0030].

4. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Voegeli and evidenced by Pelecky and further in view of Mattheis [US 20010020847]; or over Voegeli in view of Shappir and evidenced by Pelecky and further in view of Mattheis.

Teaching of the prior art is aforementioned, but appears to be silent in teaching the temperature of an environment comprising a substrate on which magnetic layer structure is formed is the same before and after the current pulse. Mattheis remedies this.

Regarding claim 17, Mattheis teaches setting a magnetization of the magnetic layer structure (spin valve) [0003] on a substrate [0032] wherein only the

magnetoresistive sensor element (magnetic layer structure) is heated [0018] and heating may be performed via pulsed currents [0032].

It would have been obvious to one of ordinary skill in the art to localize the heating to only the magnetic layer structure without affecting elements outside the substructure such as the substrate and other elements on the substrate as suggested by Mattheis. One would have been motivated to do so to selectively modify each sensor to a desired magnetization in a simple fashion [Mattheis, 0005].

5. Claims 8, 11 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Voegeli evidenced by Pelecky and further in view of Gill [US 6118622]; or over Voegeli in view of Shappir and evidenced by Pelecky and further in view of Gill.

Teaching of the prior art is aforementioned, but appears to be silent in applying a magnetic field in a desired direction to a bias layer of the magnetic layer structure, wherein the current pulse heats the magnetic layer until a temperature of the bias layer increases above a corresponding blocking temperature; and switching off the magnetic field after the temperature of the at least one bias layer decreases to below Neel or Curie temperature of the bias layer. Gill remedies this.

Regarding claim 8 and 19, Gill teaches a setting magnetic orientation of a magnetic read head with a spin valve (magnetic layer structure comprising at least one bias layer) wherein a magnetic field in a desired direction is applied to a bias layer (i.e. antiferromagnetic layer) during the current pulse [abstract], the current pulse heating the magnetic layer structure until a temperature of the bias layer increases above a corresponding blocking temperature and removing the magnetic field after the cooling

below the blocking temperature of the antiferromagnetic layer so as to retain the desired biasing (wherein bias layer is given it broadest and reasonable interpretation) [col 4, ln 1-35]. Although Gill does not explicitly teach lowering below Neel or Curie temperature of the bias layer, it would have been evident that the cooling step would include decreasing the temperature below Neel temperature, since the applicant teaches the blocking temperature is generally lower than the Neel temperature [pg 4, ln 30-35].

Regarding claim 11, the prior art teaches the device may be included in a magnetic system having a plurality of magnetoresistive devices [Voegeli, col 8, ln 1-10].

6. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Voegeli in view of Gill and evidenced by Pelecky and further in view of Lenssen [US 6501678]; or over Voegeli in view of Shappir and Gill and evidenced by Pelecky, and further in view of Lenssen.

Teaching of the prior art is aforementioned, but appears to be silent in teaching the magnetic system is arranged in a Wheatstone bridge configuration. Lenssen remedies this.

Regarding claim 12, Lenssen teaches a method for manufacturing or repairing magnetic data system [title], wherein Lenssen teaches it is often required in a number of applications to distinguish sensor system and sensing system due to temperature variations. One approach would be to configure the giant magnetoresistive sensor (GMR) in a Wheatstone configuration [col 2, ln 10-28].

It would have been obvious to one of ordinary skill in the art to configure the magnetic system into a Wheatstone bridge arrangement. One would have been

motivated to do so in order to reduce unwanted response to environmental factors that may be picked by the sensing system [Lenssen, col 2, ln 19-23].

7. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Liu [US 6204139] in view of Chaparala [US 20020168130] and Mattheis [US 20010020847].

Regarding claim 13, Liu teaches a method of manufacturing a magnetoresistive element by forming a magnetic layer structure [col 3, ln 20-25] heating the magnetic layer structure by applying an electric current [col 3, ln 35-36], the electric current comprising a current pulse having a duration that prevents substantial heat transfer from the magnetic layer to an environment outside the magnetic layer structure (where a position could be made that a large distance away from the heated magnetic layer that receives no substantial heat such as outside a processing chamber would also read as an environment of the magnetic layer structure) [col 5, ln 10-11]; where current pulse is localized in the magnetic layer structure [col 3, ln 35-40]; and wherein the current pulse is applied for offset compensation by irreversibly changing a resistance of at least one of the magnetoresistive element through local heating [abstract, col 5, ln 20-23]. However, Liu appears to be silent in teaching the magnetoresistive element is arranged in a bridge configuration. Chaparala remedies this.

Regarding claim 13, Chaparala teaches coupling an optical switch with a magnetic sensor via a bridge circuit, wherein the magnetic sensor may be a colossal magnetoresistance sensor [0040], wherein if a plurality of sensors are coupled to a bridge circuit, the output of a bridge circuit can be made sensitive to the changes in a variety of properties to be sensed [0044].

It would have been obvious to one of ordinary skill in the art to couple a plurality of magnetic resistive devices into a bridge configuration as taught by Chaparala. One would have been motivated to do so to better sense changes of a desired property (i.e. angular orientation).

However, Liu in view of Chaparala appears to be silent in teaching the heat resulting from the current pulse is substantially localized in the magnetic layer structure. Mattheis remedies this.

Regarding claim 13, Mattheis teaches heating performed through the use of currents in a pulsed fashion via the sensor elements can achieve local heating with particular advantage in the case of a plurality of sensor elements provided on a common substrate [0032]. Hence, it would have been obvious to one of ordinary skill in the art to locally heat sensor elements via pulsed currents as suggested by Mattheis. One would have been motivated to do so in order to provide a simple setting of modifying the properties of the individual sensors in a system [Mattheis, 0005].

8. Claims 1, 3, and 6-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fox evidenced by Pelecky in view of Shappir.

Regarding claim 1, Fox teaches a method for forming a device with a magnetic layer structure by forming the magnetic layer structure [col 2, ln 62-67], and heating the magnetic layer structure with an electric current, the electric current comprising a current pulse having a duration such that no substantial heat transfer from the magnetic layer structure to an environment (insulating layers) of the magnetic layer structure takes place [col 3, ln 65-67; col 4, ln 1-10], which the heat resulting from, the current

pulse is substantially localized within the magnetic layer structure. Fox further teaches selecting a particular duration and amplitude of the current pulse so as to reach a desirable heat temperature so as to orient the magnetic spins and modify the magnetic moment (physical process) of the magnetic layer structure [col 11, ln 20-40].

As for selecting a physical process from a plurality of physical processes having corresponding activation energies in the magnetic layer structure based on the current pulse, it is evidenced by Pelecky that changes in magnetization of a material occur through activation over an energy barrier, wherein each physical mechanism responsible for an energy barrier has an associated length scale [pg 1771]; therefore, one of ordinary skill in the art would have selected a particular duration and amplitude to overcome the activation energy required to achieve the selected magnetic property that is to be modified from a range of magnetic properties with associated activation energies. Furthermore, Fox teaches resistance is another property that can be changed by modifying magnetic moments of the layer structure [col 7, ln 59-65]. This would suggest that changes in resistance can occur from applying at least one pulsed current to the magnetic layer structure.

In addition, although Fox teaches selecting the current duration and amplitude based upon the desired property to be modified, it would have been obvious to one of ordinary skill in the art to either select the physical process for modifying the layer property based upon the current or select the current based upon the physical process for modifying the layer property since the prior art teaches both criteria are inter-related for achieving similar results.

However, Fox appears to be silent in teaching a plurality of different physical processes may be modified from applying a current pulse. Shappir remedies this.

Regarding claim 1, Shappir teaches a method for applying operating pulses to memory cells [abstract] which singly changes at least one of an electrical, physical and mechanical property of the cell [0020] (wherein the operating pulse is measured in voltage; i.e. pulse is electric) [0028]. Shappir further teaches change in the direction of the magnetization of vectors or change in resistance are both considered as examples of electrical, physical and/or mechanical properties [0030].

It would have been obvious to one of ordinary skill in the art to select a physical process from a plurality of physical processes and further modify the magnetic layer structure with a current based upon the selected physical process as suggested by Shappir. One would have been motivated to do so in order to reduce energy use and increase throughput [Shappir, 0013-0014].

Regarding claim 3, the prior art teaches selecting a physical process (orienting magnetic spin) in a magnetic layer (pinning layer) [Fox, col 11, ln 35-45; col 10, ln 35].

Regarding claim 6, the prior art teaches the device comprises a magnetoresistive device [Fox, abstract].

Regarding claim 7, the prior art teaches the device is a sensing device [Fox, col 4, ln 3].

Response to Arguments

9. Rejections under 35 USC 112, second paragraph are withdrawn due to applicant's amendments.

10. Applicant's arguments with respect to claims 1, 3-8, 10-13, 16-19 have been considered but are moot in view of the new ground(s) of rejection necessitated by amendments (i.e. resulting from the current pulse is substantially localized within).

11. Applicant's arguments filed 6/7/10 have been fully considered but they are not persuasive.

Regarding applicant's argument of Voegeli, particularly "although interdiffusion may apparently be performed on different layers/materials, it is still the same process," the examiner refute that "different" is a relative term, which will be given its broadest and reasonable interpretation. In addition, the examiner argues that interdiffusion of A and B would in fact be physically different from interdiffusion of C and D, regardless if they are both interdiffusion.

Regarding applicant's argument of Pelecky, particularly "only disclosing a process for changing magnetization of magnetic material," the examiner notes that Pelecky is relied upon as evidence 'that changes in magnetization of a material occur through activation over an energy barrier.' Arguments for Pelecky only teaching one physical process is moot.

Regarding applicant's argument of Mattheis, it is noted by the examiner that the applicant is arguing the combination of Mattheis for claim 8; however, since the applicant has amended claim 8, such arguments are not moot. However, Mattheis is

now used for 'heating only the magnetic layer structure without affecting elements outside the substructure such as the substrate' in claims 13 and 17 which relies upon a different teaching than of claim 8.

Applicant's argument of Lenssen for claim 13 is moot, since teachings of Liu in view of Chaparala and Mattheis are now relied upon for newly amended claim 13.

Conclusion

1. No claim is allowed.

2. Claims 1, 3-8, 10-13, 16-19 are rejected for the reasons aforementioned.

3. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MANDY C. LOUIE whose telephone number is (571)270-5353. The examiner can normally be reached on Monday to Friday, 7:30AM - 5:00PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks can be reached on (571)272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/M. C. L./
Examiner, Art Unit 1792

/Timothy H Meeks/
Supervisory Patent Examiner, Art Unit 1715